CHAPTER I

INTRODUCTIONS

The ultimate aim of communication systems is to transmit information from the information source to the destination without any errors like noise, bandwidth, attenuation, limitations, inference etc., which are introduced in the channel. One of the ways of detecting and correcting these errors over a noisy communication channel is by investigating the art of Error Correcting Codes.

The intention of reducing these errors has resulted in the invention of different types of codes like linear codes, non-linear codes, convolutional codes etc., each designed to meet specific transmission requirements in specific channels. Linear codes are ones of the types of codes that can reduce the errors to a considerable extent. The quest running for decades in Coding Theory for finding the maximum possible dimension (size) of linear codes with given parameters has been quenched by computing upper and lower bounds for linear codes.

In 2006, K. Feng, L. Xu and F. J. Hickernell [3] gave a nice generalization of linear codes by modifying the Hamming distance. The code constructed in blocks with respect to a partition of its length is called a "Linear Error-Block Code". They studied two upper bounds for linear error-block codes : the $\pi-$singleton bound and the $\pi-$Hamming bound for linear error-block codes.

In this thesis, we investigate optimal linear error-block codes in two directions : maximal dimension and maximal minimum $\pi-$distance.

In chapter 2, we quickly review basic properties of linear codes. Analogously, linear error-block codes which were initiated by K. Feng, L. Xu and F. J. Hickernell

will be introduced along with terminologies used throughout this thesis.

Chapter 3 will give various lower bounds and upper bounds of $k_{\max}(n, d, q; \pi)$, the maximum dimension of linear error-block codes where the parameters n, d, q and π are fixed. Using suitable bounds, we obtain maximal dimension codes in many cases. Moreover, some maximal minimum $\pi-$distance codes are obtained in the same fashion.

In chapter 4, more efficient linear error-block codes have been constructed from codes whose existences are guaranteed by lower bounds in chapter 3 or some other constructions. These modifications fill up some gaps occurred in chapter 3 and optimal codes are rewarded.